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BRIEF INTRODUCTION TO MISSILE DESIGN BUREAUS AND MODEL NUMBERS

by

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You Zhicheng and Xu Haijiang

ABSTRACT: Designations and industrial index types for missile model numbers of Russia (former Soviet Union) are introduced. All the published Russian missile model numbers, including air-to-air missiles, air-to-surface missiles, and surface-to-surface missiles are listed. A brief introduction is made to 20 missile (or missile-related) design bureaus in Russia.

Key Words: Russia, air-to-air missiles, air-to-surface missiles, antitank missiles, air defense missiles, ballistic missiles, surface-to-surface missiles, and cruise missiles.

[NOTE: # = transliteration]

I. Designations of Russian Missiles

1.1. General Description

The designations and names used in Russia's guided missile systems are quite confused. Before the Soviet Union opened up to the outside world, guided missiles of the former Soviet Union were known through the designations and names chosen in the West; in other words, by the American designations and the standard NATO names. However, in recent years, export advertisements were publicized for missiles built by the aerospace industry in Russia, bearing Russian designations. Such designations confuse western readers, because there are no clear correlations between

Russian designations and western designations. The article attempts to provide a complete catalog of the presently-known missile designations of Russia and the corresponding designations and names in the West. In some situations, the tables include some published Russian missile systems without American designations or NATO names.

The system of missile designations and names by the United States and NATO are widely known. It is quite difficult to briefly describe the types of Russian missile designations. Some of the reasons include the long-standing practice of secrecy. However, in some cases, due to variants with the passage of time and complex research organizations, as missiles of the former Soviet Union were developed by numerous design bureaus, and these design bureaus were under different industrial ministries in order to meet the requirements of various branches of the armed services of the former Soviet Union. Therefore, there were many different names and designation systems for missiles. Generally, some missiles are a very small portion of a vast weapon system, which usually includes launch facilities and fire control system. The complex is much more involved and much higher in cost than the missile itself. Therefore, with respect to the designations of missiles proper, this indicates the designation of the missile system.

1.2. Types of Designations in Industrial Catalogs

The designation system in industrial catalogs makes use of a few generalized constituents in all model numbers. Generally, this system is arranged as digit/letter/digit. This arrangement has been widely applied in the military systems of the former Soviet Union. Generally, this is the lowest level of types of the system, because these designations are usually sprayed on the exterior missile surface for compilation by the manufacturing plant. For example, 9M9 indicates the SA-6 missile, as designated in the West; however, 2A46 indicates the 125-mm cannon installed on T-72 tanks.

From the tables in the article, we can clearly see some layout method of the numbers. The first number generally indicates the same missile category. For example, '2' indicates the weapon system that includes the fire control system and the missile. '3' indicates a tactical missile in its early period; '4' indicates naval missiles; '5' indicates strategic air defense missiles; '8' indicates strategic ballistic missiles; '9' indicates tactical missiles of surface troops (used to replace '3').

Letters also follow a general arrangement. Letter 'K' indicates missile system, including the missile, launch facility, and fire control system. However, 'M' and 'B' indicate the missile proper. The missile systems have their own designations: 'A' indicates the launch missile equipped with radar; 'PI' indicates the fundamental launch facility or launch vehicle. 'H' indicates the missile warhead compartment; 'C' indicates the major electronic component.

A set of numbers following the letters is generally a continuous number array. In the eighties, this approach was improved into a three-digit numbering system involving ground troop missiles: 9M1XX indicates an antitank missile; 9M2XX indicates an unguided rocket; 9M3XX indicates a surface-to-air missile (SAM); and 9M7XX indicates a tactical ballistic missile. Variation in this period meant that missile numbering also changed over time. For example, the SA-6 Gainful missile was named 3M9 in the late sixties. Later, the first number was changed, and the missile was called 9M9; today it is called 9M336, because of coping with the requirements of new numbering types using three numbers at the end.

In a more complex situation, some tail mark is often added after the fundamental designation. Generally, these tail marks indicate different versions of the fundamental missile system. The most general form is to add an 'M' and a number. Therefore, 9M336 indicates the first version, and 9M336M1 indicates the

second version, and so on. Another frequently used tail mark is the letter 'E', indicating the export model number. Some industrial ministries adopt different systems by eliminating 'M'. For example, 9M112-1 indicates the first version, and 9M112-2 indicates the second version, and so on. This table does not include all the model numbers.

1.3. Missile Design Bureaus

As in the West, in the missile design stage, a temporary designation or name is tagged onto a missile project by design bureaus in Russia. Once the missile passes acceptance inspection by the state committee, it receives a formal designation. These code numbers and temporary designations are almost always not mutually consistent. To be helpful in understanding such a system, in the table of the article for the first time the design bureau developing these missiles are given. For complicated systems, such as air-defense missiles, the table first lists the missile design bureau before the design bureau responsible for assembling the entire system. These design bureaus are electronic equipment companies integrating the missile, missile guidance radar, missile acquisition radar, as well as weapon command and control system into a single system.

As in the case of the missile proper, these design bureaus also reveal a certain confusion. They are known as the number code (such as OKB-2, indicating Experimental Design Bureau Number 2), and the integrator's name (such as Grosen# Experimental Design Bureau), or new combines (such as the Iskra Machine-building Design Bureau).

1.4 Types of Missile Designation

1.4.1. Air-to-air missiles (AAM)

These missiles follow a quite consistent approach. The overall weapon system uses 'K' (system) as the designation; however, the designation of the missile uses 'P' (missile) at the beginning. Although there is no listing in the table, the most

designations of air-to-air missiles in Russia use a tail mark to distinguish the guidance type. For example, 'II' indicates the infrared (IR) guidance type; however, 'P' indicates the radar guidance type. Therefore, 'P-40P' indicates the radar guidance version of the P-40 series, and P-40II indicates the infrared version in the series.

1.4.2. Air-to-surface missiles (ASM)

These missiles can be divided into two major types: tactical air-to-surface missiles and strategic air-to-surface missiles, as well as strategic air-launched cruise missiles. In the development period, tactical missiles are given a product designation. Later, this designation has the similar function of designation in the industrial indexing of most other types. When such missiles are accepted by a branch of the armed forces, it is given an 'X'-xx, like air-to-air missiles. Frequently, some tail marks are added to the designation of these missiles, to indicate the guidance type. These tail marks include the following: 'P' (radio command); 'T' (TV-EO); 'PI'(passive radar homing); and 'LAMBDA' (semiactive laser homing). Numbering of strategic cruise missiles does not follow a consistent system, because many design bureaus took part in the development of such missiles. However, generally, they are given a designation beginning with 'K'.

1.4.3. Antitank missiles (ATGM)

These missiles were developed by precision machinebuilding industrial departments, and follow a quite consistent industrial indexing system. Obviously, these are not listed in the table. However, some missiles fired from tanks have designations for their ammunition (besides code numbering for the missile), because these are also in inventory and kept as supplies. Therefore, 9M119 (125mm) missiles are also called 3UBK14. This designation is not given in the table to avoid confusion.

1.4.4 Air defense missiles (SAM)

Tactical air defense missiles follow an entirely consistent system of industrial indexing; however, strategic air defense missiles follow a not-quite-consistent scheme of industrial indexing. In the early stage, this type of missile generally has system designations prefixed with 'C' (strategic: and 'B' (tactical). It is very common that an air defense system has a domestic name and an export name. However, the export model IFF system sold to developing countries is a lower-technical-level grade. Generally, strategic air defense missiles are named after rivers, and tactical air defense missiles are named after geometric shapes or sharp-pointed weapons, such as circle, rhombus, arrow, needle).

1.4.5 Ballistic missiles (BM)

These missiles adopt a very consistent approach in designations. In the designations of most intercontinental ballistic missiles (ICBM) there is a PC as the tail mark, indicating strategic missiles, although some early solid-fuel missiles have 'T' used as the tail mark, indicating solid, such as PT-2. The name of an intercontinental ballistic missile generally indicates the entire weapon system, including launch silo or other launch facility. Very obviously, the designation of some missiles in the seventies is related to the designation of the prototype missiles in the sixties. This is because improvements in presently-available weapons can be more easily approved by the government than the development of a new weapon system. Therefore, the designation of SS-18 is P-36MY, although there is no similarity with P-36 (SS-9). Many missiles related to arms control talks are given false designations, such as the designation of 'OTP' used to indicate tactical ballistic missiles. Thus, these missiles are not included in the Intermediate Nuclear Forces Treaty (INF).

1.4.6 Ship-launched surface-to-surface missiles (SS-N)

Designations of this missile type are the most inconsistent because antiship cruise missiles, antisubmarine torpedo rockets, and strategic ballistic missiles are also included in this very broad missile type. There is a tendency for tactical antiship missiles to have the tail mark 'P', but antisubmarine weapons (ASW) usually have 'P' added after two numbers (such as 82-P). In development, ship-launched ballistic missiles (SLBM) have a classified D-xx designation. During deployment, a P-xx and a 4K-xx are given as the designation. However, in the SALT talks, a designation of PCM-xx was given.

II. Catalog of Russian Missile Designations

DESIGNATIONS OF RUSSIAN MISSILES

美国代号 1	北约名称 2	俄罗斯系统代号和名称 3	俄罗斯导弹代号 4	设计局名称 5
2.1 空空导弹 6		7		8 9
AA-1	碱(Alkali)	K-5;K-55;产品号:1	PC-У,PC-2У,P-55	火炬,托洛波夫
AA-2	环礁(Atoll)	K-13;产品号:301 7	P-3,P-13 9	托洛波夫,桅顶旗 10
AA-3	阿纳布(Anab)	K-8;K-98	P-8,P-98	比斯诺瓦特 11
AA-4	锥子(Awl)	K-9	P-9	米高扬 12
AA-5	灰(Ash)	K-80 7	P-4 11	比斯诺瓦特
AA-6	毒辣(Acrid)	K-40;K-46;产品号:84	P-40,P-46	10桅顶旗
AA-7	尖顶(Apex)	K-23;产品号:340;产品号:360	P-23,P-24	10桅顶旗
AA-8	蚜虫(Aphid)	K-60;产品号:62 7	P-60 11	比斯诺瓦特,桅顶旗10
AA-9	阿莫斯(Amos)	K-100 7	P-33	桅顶旗 10
AA-10	三角叶杨(Alamo)	产品号:470 7	P-27	桅顶旗 10
AA-11	弓箭手(Archer)	产品号:72 7	P-73	桅顶旗 10

AT-15

AT-16

2.5 面面导弹 39

FROG-1

FROG-2

FROG-3

FROG-5 42

FROG-7A

FROG-7B

2.6 防空导弹 43

SA-1 吉尔德(Guild)

SA-2 盖德莱(Guideline)

工头(Gaffer)

SA-3 果阿(Goa)

SA-4 加涅夫(Ganef)

小种犬(Griffon) 50

SA-5 甘蒙(Gammon)

SA-6 根弗(Gainful)

SA-7 格雷尔(Grail)

SA-8 壁虎(Gecko)

SA-9 甘斯肯(Gaskin)

SA-10 抱怨(Grumble)

SA-11 牛虻(Gadfly)

SA-12A 斗士(Gladiator)

SA-12B 巨人(Giant)

SA-13 金花鼠(Gopher)

SA-14 小妖精(Gremlin)

SA-15 鞭刑(Gauntlet)

SA-16 手钻(Gimlet)

SA-17 灰熊(Grizzly)

SA-18 松鸡(Grouse)

SA-19 灰鼬(Grison)

SA-X-20

SA-X-21 68

2.7 海军防空导弹

SA-N-1 果阿(Goa)

SA-N-2 盖德莱(Guideline)

SA-N-3 高脚杯(Goblet)

SA-N-4 壁虎(Gecko)

SA-N-5 目标(Grail)

SA-N-6 抱怨(Grumble)

SA-N-7 牛虻(Gadfly)

SA-N-8 小妖精(Gremlin)

SA-N-9 臂铠(Gauntlet)

SA-N-10 手钻(Gimlet)

SA-N-11 灰鼬(Grison) 76

хризантема

9K121 旋风 38

雕 40

火星 41

月亮 42

月亮-1

9K21 月亮-M 42

9K52 月亮-M 42

C-25 金雕 44

C-75,B-75 德维纳河,沃尔霍夫河 45 46

P3-25 47 48

C-125 涅瓦河,伯朝拉河

2K11 圆环 49

目标 A 51 52

C-200 安加拉河,伏尔加河,织女星 53

2K12 立方体,正方形 54 55

9K32 箭-2 56

9K33 菱形,黄峰 57 58

9K31 箭-1 54

C-300П 60 111

9K37 山毛榉-1M,恒河

C-300B1

C-300B

9K35 箭-10 54

9K34 箭-3 54

圆环 49

9K310 针-1 59

山毛榉-2M,乌拉尔河 60 61

9K38 针 59

2K22 三角形 62

C-400

мыск

4K90 波浪,M-1 69

沃尔霍夫河,M-2 46

4K60,4K65 烈风 70

4K33 黄峰-M 71

4K32M 箭-2 54

C-300Ф 堡垒,рит 72

M-22 飓风,风平浪静 73 74

针 59

кинжал,刀刃 75

针-1M 59

佩剑,栗树 76 77

9M120 34 涅波比迪米

3P-1

3P-2

3P-9

3P-10

3P-11,P-65,9M21

P-70,9M52

63 15

P-113,B-300 拉沃契/金刚石

B-750 8 火炬/金刚石 15

B-400 拉沃契金 64

5B24,5B27 8 火炬/金刚石 15

3M8,9M8 革新家 13

B-1000 8 火炬/金刚石 15

B-860,5B28 8 火炬/金刚石 15

3M9,9M9,9M336 桅顶旗/НИИП NIIP

10

9M32 34 涅波比迪米

9M33 8 火炬/安泰 65

9M31 35 努杰尔曼/НИИП NIIP

5B55,48H6 8 火炬/金刚石 15

9M38 13 革新家/НИИП NIIP

9M83 13 革新家/安泰 65

9M82 13 革新家/安泰 65

9M37 35 努杰尔曼

9M36 34 涅波比迪米

9M330,9M331 8 火炬/安泰 65

9M313 34 涅波比迪米

9M38M2 13 革新家/НИИП NIIP

9M39 34 涅波比迪米

9M311 КБП KBP

66 火巨型/金刚石 15

13 革新家/НИИП NIIP

B-600 8 火炬/牵牛星 67

B-753 8 火炬/牵牛星 67

B-611 8 火炬/牵牛星 67

9M33 8 火炬/牵牛星 67

9M32M 34 涅波比迪米

5B55,48H6 8 火炬/牵牛星 67

9M38 13 革新家/牵牛星 67

9M39 34 涅波比迪米

9M330 8 火炬/牵牛星 67

9M313 34 涅波比迪米

9И311 KBP КБП/牵牛星 67

AA-12 产品号:170 P-77 桅顶旗 10
尚无代号 12 7 P-37 桅顶旗 10
尚无代号 12 KC-172 P-72? 13 革新家

2.2 反弹道导弹 14

ABM-1 橡皮套鞋(Galosh) A-35 A-350 8 火炬/金刚石 15
ABM-X-2
ABM-3 瞪羚(Gazelle) 革新家 13
ABM-3 戈耳戈(Gorgon) 火炬 8

2.3 空面导弹 16 17

AS-1 狗窝(Kennel) 慧星,4K87 KC-1 米高扬 12
AS-2 鲟鱼(Kipper) EH,K-10 РСЛ-1 米高扬 12
AS-3 袋鼠(Kangaroo) K-20 X-20 米高扬 12
AS-4 厨房(Kitchen) K-22 X-22 彩虹 18
AS-5 鲑鱼(Kelt) K-11 KCP-2 彩虹 18
AS-6 王鱼(Kingfish) K-26 KCP-5 彩虹 18
AS-7 黑牛(Kerry) 产品号:66 X-66,X-23 新星 19
AS-8 (改为 AT-6 螺旋) 20 7
AS-9 飞镖(Kyle) 7 7 X-28 新星 19
AS-10 克伦(Karen) 产品号:69,产品号:713 X-25 新星 19
AS-11 平衡(Kilter) 产品号:112 7 X-58 彩虹 18
AS-12 投球手(Kegler) 产品号:711 7 X-25МП,X-27 新星 19
AS-13 中柱(Kingpost) 牛虻 109 X-59 新星 19
AS-14 小锚(Kedge) 产品号:64 7 X-29 桅顶旗 10
AS-15 撑竿(Kent) PKB-500 X-55 彩虹 18
AS-16 反冲(Kickback) PKB-15 X-15 彩虹 18
AS-17 氪(Krypton) 产品号:77 7 X-31 新星 19
AS-18 卡祖笛(Kazoo) 牛虻-M 109 X-59M 19 新星
AS-X-19 考拉(Koala) 雷 22 21 切罗米伊
AS-20 3M60,天王星 23 X-35 新星 19
尚无代号 12 3M80,白鲑 24 X-41 19 彩虹
尚无代号 12 X-65 彩虹 18

2.4 反坦克导弹 25 26

AT-1 甲鱼(Snapper) 2K15 熊蜂 2M2,3M6 34 涅波比迪米
AT-2 蝇拍(Swatter) 2K8,9K8 避日虫 27 3M11,9M17 35 努杰尔曼
AT-3 萨格尔(Sagger) 9K11 婴儿 28 9M14 34 涅波比迪米
AT-4 塞子(Spigot) 9K111 巴松管 29 9M111 КБП KBP
AT-5 拱肩(Spandrel) 9K113 竞赛 30 9M113 КБП KPB
AT-6 螺旋(Spiral) 9K114 风暴 31 9M114 34 涅波比迪米
AT-7 萨克斯号(Saxhorn) 9K115 杂种 32 9M115 КПБ KPB
AT-8 歌手(Songster) 9K112 眼镜蛇 33 9M112 КБП KPB
AT-9 110
AT-10 锐器(Stabber) 9K116 棱堡 9M117 КБП KPB
AT-11 狙击手(Sniper) 9K119 回流/свир 36 9M117 КБП KPB
AT-12 锐器(Stabber) 9K116-1шексна 9M117 КБП KPB
AT-13 9K115-1 杂种-2 32 9M131 КБП KPB
AT-14 短号 37

SA-N-12 78 灰熊(Grizzly)

2.8 弹道导弹

SS-1a 讨厌者(Scunner)
SS-1b 飞毛腿 A(ScudA)
SS-1c 飞毛腿 B(Scud B)
SS-2 同胞(Sibling)
SS-3 讼棍(Shyster)
SS-4 凉鞋(Sandal)
SS-5 短剑(Skean)
SS-6 警棍(Sapwood)
SS-7 鞍工(Saddler)
SS-8 黑羚羊(Sasin)
SS-9 悬崖(Scarp)
SS-10 瘦子(Scrag)
SS-11 赛果(Soge)
SS-12 薄板(Scaleboard)
SS-13 野人(Savage)
SS-14 无赖(Scamp)
SS-15 啬徒(Scrooge)
SS-16 恶棍(Sinner)
SS-17 佼佼者(Spanker)
SS-18 撒旦(Satan)
SS-19 方硒锌矿(Stilleto)
SS-20 佩剑(Saber)
SS-21 圣甲虫(Scarab) 119
SS-22 (被取消,改为底板 2 型)
SS-23 蜘蛛(Spider)
SS-24 解剖刀(Scalpel)
SS-25 107 镰刀(Sickle)

2.9 面面(巡航)导弹

SSC-1a 沙道克(Shaddock)
SSC-1b 萼片(Sepal)
SSC-2a 萨利士(Salish)
SSC-2b 幼鲑(Samlet)
SSC-3 冥河(Styx)
SSC-4 弹弓(Slingshot)
SSC-5
SSC-6 108

2.10 海军面面导弹

SS-N-1 扫帚(Scrubber)
SS-N-2 冥河(Styx)
SS-N-3 沙道克(Shaddock)
SS-N-4
SS-N-5 萨克(Sark)
SS-N-6 塞尔布(Serb)
SS-N-7 星光(Starbright)

ежик

8A11
8K11
8K14
8K38
8K51 45
8K63,8K63У 德维纳河
8K65,8K65У,усовая
8K71,8K74
8K64
8K75 112 杰斯纳河
8K67
8K713
8K84 83
9M76 速度
8K98
8K96
9K99

84
开拓者
9K79 圆点 85
86
9K714 奥卡河
87
白扬
88
ФКР-2 进步
4K95 多面堡 89
4K87,ФКР-1 慧星 17
4K87 山丘 90
4K40 界线-A 91
РК-55 石榴石 92
23
3M60 天王星
54
КСШ,箭 93
4K40,白蚊,界线 91
4K95,进步 88
4K50
4K55
牙齿 94
紫水晶 95

9M38M2 13 革新家/牵牛星 67

Р-1 79 卡拉列夫
Р-11,Р-175 79 卡拉列夫
Р-17,Р-300 80 马可耶夫
Р-2 79 卡拉列夫
Р-5 79 卡拉列夫
Р-12 81 扬杰尔
Р-14 81 扬杰尔
Р-7 79 卡拉列夫
Р-16 81 扬杰尔
Р-9 79 卡拉列夫
Р-36 81 扬杰尔
ГР-1 79 卡拉列夫
РС-10,УР-100 切罗米伊 21
ТР-1,ОТР-22 纳基拉杰 82
РТ-2,РС-12 79 卡拉列夫
РТ-2П 79 卡拉列夫
РТ-20П 81 扬杰尔
РС-14 82 纳基拉杰
УМ-100М,РС-16 扬杰尔 81
Р-36М,РС-20 扬杰尔 81
УР-100Н,РС-18 切罗米伊 21
РСД-10 82 纳基拉杰
9М79 34 涅波比迪米
9М714,ОТР-23 34 涅波比迪米
РС-22 扬杰尔 81
РС-12М 82 纳基拉杰

П-5 切罗米伊 21
С-35 切罗米伊 21
С-2 米高扬 12
С-2 米高扬 12
П-20,-21 彩虹 18
РК-55 18 彩虹

Х-35 19 新星
21
切罗米伊
П-15,П-20,П-21 彩虹 18
П-5,П-7,П-35 切罗米伊 21
Р-13,Д-2 马可耶夫 80
Р-21,Д-4 马可耶夫 80
Р-27,РСМ-25 马可耶夫 80
П-120 21 切罗米伊

SS-N-8	索弗莱(Sawfly)	96	PCM-40	21	切罗米伊
SS-N-9	海妖(Siren) 113	4K85,孔雀石	П-50	21	切罗米伊
SS-N-10	被取消,改为 SS-N-14				
SS-N-11	被取消,改为 SS-N-2C 113	97			
SS-N-2	沙箱(Sandbox)	4K80,玄武岩	П-500	21	切罗米伊
SS-N-13		4K18			
SS-N-14	石英(Silex)	托叶鞘 98	85-P	18	彩虹
SS-N-15	星鱼(Starfish)		81-P	13	革新家
SS-N-16	牡马(Stallion)	УРПК-4 瀑布 99	КТ-100	13	革新家
SS-N-17	沙锥(Snipe)		РСМ-45	80	马可耶夫
SS-N-18	鱼(Stingray)	波浪 100	Р-2С,РСМ-50	80	马可耶夫
SS-N-19	海难(Shipwreck)	花岗石 101	П-500	21	切罗米伊
SS-N-20	鲟鱼(Sturgeon)	3Р65	3М20,РСМ-52	80	马可耶夫
SS-N-21	桑普森(Sampson)	石榴石 92	РКВ-500	18	彩虹
SS-N-22	日炙(Sunburn)	白蛉 102	3М80	18	彩虹
SS-N-23	划艇(Skiff)	无风 103	РСМ-54	80	马可耶夫
SS-N-24	蝎子(Scorpion)	雷 22	П-750	21	切罗米伊
SS-N-25		3К60 天王星 23	Х-35	19	新星
尚无代号	114		П-80,П-90,П-100	切罗米伊	21
尚无代号	114		宝石 115	切罗米伊	21
尚无代号	114		阿尔法 116	切罗米伊	21
尚无代号	114		火山 117		
尚无代号	114	104	编玛瑙 118		
SUW-N-1	FRAS-1	РПК-1 暴风雪	82-P	革新家	13

105 106

КБП——仪器制造设计局；НИИП——仪器制造科学研究院。

[NOTE: # = transliteration]

KEY: 1 - American designations 2 - NATO names 3 - Russian designations and names of Russian missile systems 4 - Russian designations of missiles 5 - name of design bureau 6 - air-to-air missiles 7 - product number 8 - Iskra, Tupolev 9 - Tupolev 10 - Pennant 11 - Pisnowad# 12 - Mikoyan 13 - Innovator 14 - antiballistic missile 15 - Diamant 16 - air-to-surface missiles 17 - Komet 18 - Raduga 19 - Nova 20 - changed to AT-6 Spiral 21 - Chilomiyi# 22 - Thunder 23 - Uranus 24 - sandfly 25 - antitank missiles 26 - insect on bear 27 - insect shying from sun 28 - infant 29 - Poisson tube 30 - contest 31 - storm 32 - hybrid 33 - cobra 34 - Nippodimi# 35 - Nochelman# 36 - return flow 37 - short number 38 - Tsiklon 39 - surface-to-surface missiles 40 - sculpture 41 - Mars 42 - Moon 43 - air defense missiles 44 - gold sculpture 45 - Dvina River 46 - Volkoff# River 47 - Neva River 48 - Patsola# River 49 - circular ring 50 - target 51 - Angara River 52 - Volga

River 53 - Vega 54 - cubic 55 - perfect cube 56 - arrow 57 - rhombic 58 - wasp 59 - needle 60 - beech 61 - Ural River 62 - triangular 63 - Laochi# 64 - Laochikin# 65 - Antai# 66 - Iskra type 67 - Altair 68 - ship-launched air defense missiles 69 - wave 70 - gale 71 - wasp 72 - castle 73 - hurricane 74 - calm 75 - blade 76 - saber 77 - chestnut tree 78 - ballistic missiles 79 - Kalalief# 80 - Makoyoff# 81 - Yangill# 82 - Najilaji# 83 - speed 84 - explorer 85 - circular point 86 - Oka River 87 - white poplar 88 - progress 89 - multisurface castle 90 - hill 91 - border line 92 - garnet 93 - termite 94 - teeth 95 - amethyst 96 - malachite 97 - basalt 98 - leaf sheath 99 - waterfall 100 - wave 101 - granite 102 - white insect 103 - stillness 104 - snowstorm 105 - instrument-making and design bureau 106 - Scientific Research Institute of Instrument Making 107 - surface-to-surface cruise missile 108 - ship-launched surface-to-surface missiles 109 - gadfly 110 - limbo 111 - Ganges River 112 - Chesna# River 113 - It was cancelled and redesignated as 114 - Lacks designation 115 - gemstone 116 - alpha 117 - volcano 118 - onyx 119 - it was canceled and renamed Base plate model

III. Brief Introduction to Russian Guided Missile Design Bureaus

3.1 Diamant Design Bureau

This design bureau was founded at Moscow after World War II, led by L. Piliya#. At the outset, this was called First Professional Bureau (SB-1) and the First Design Bureau (KB-1), with the tasks of being responsible to absorb advanced technology from Germany. In the mid-fifties, under the leadership of A. A. Listpolikin#, it began research on missile guidance, especially for air defense systems. The bureau is presently called the Diamant Consortium for Scientific Research and Production, led by Bounkin#.

3.2 Antai Design Bureau

The Antai Consortium of Scientific Research and Production is a military electronics instrument corporation. As a comprehensive design bureau for tactical surface-to-air missiles (SAM), the consortium frequently competes with the Diamant Design Bureau. The Antai Design Bureau is located in Moscow and is also

referred to as the Antai Consortium of Scientific Research and Production.

3.3 Pisnowad# Design Bureau

This is the fourth experimental design bureau (OKB-4), separated from the Mikoyan Number 155 Experimental Design Bureau (OKB-155). M. Pisnowad# is responsible for air-to-air missiles, and G. Rukinski# is responsible for the development of cruise missiles and winged spacecraft. Later, the design bureau was renamed Molniya Design Bureau, taking part in the late seventies in the development of Buran spacecraft in the Soviet Union; all air-to-air missile developments were transferred to the Pennant Design Bureau.

3.4 Chiromi# Design Bureau

This design bureau was founded in 1944; its formal name is Number 52 Experimental Planning Bureau (OKB-52). At this time, this was for the development of missile 10X, corresponding to the V-2 rocket of Germany. Due to political reasons, the design bureau operations were suspended in 1953. However, in the mid-fifties, the bureau again began the development of naval cruise missiles. This design bureau tried to compete with the First Experimental Design Bureau (RKB-1) in designs of ICBM and ship-launched ballistic missiles. However, the bureau enjoys the highest reputation for its design of military reconnaissance satellites, spacecraft carrier rockets, and naval guided missiles. At present, this design bureau is located in Lievtoff#, a Moscow suburb. Now, the bureau is called the Machinebuilding Consortium for Scientific Research and Production.

3.5. Iskra Design Bureau

This design bureau is generally referred as the Grossen# Design Bureau, or the Second Experimental Design Bureau (OKB-2), separated from the Laochiki# Number 577 Experimental Design

Bureau (OKB-577) in the early fifties, and eventually became the major development organization for air defense missiles. At present, the design bureau is located at Khimki, a Moscow suburb. Now, this bureau is called the Iskra Machinebuilding Design Bureau.

3.6 Instrument-Making and Design Bureaus

This Instrument-making and Design Bureau (KBP) is located in Tula; the bureau grew out of a major small arms research center in Russia. Previously, the design bureau took part in the design of aircraft cannons. In recent years, the bureau specialized in the development of antitank missiles under the leadership of A. Shipnov#. Recently, the bureau began taking part in the development of surface-to-low-altitude missiles, such as the SA-19.

3.7 Korolyev Design Bureau

This design bureau was located in Kalinin, a Moscow suburb, formally called the First Experimental Design Bureau (OKB-1), led by S. Korolyev, the design bureau undertook the development of all early ballistic missiles and space activities in the Soviet Union, growing out of the First Experimental Design Bureau, some of the design bureaus is the Number 586 Professional Design Bureau (SKB-586), the Mikoyan Design Bureau, and the Nachilagi# Experimental Design Bureau (OKB). In the late sixties the first Experimental Design Bureau separated from activities on guided missiles, engaging in space development. Today, this design bureau is called the Energy Source Consortium of Scientific Research and Production.

3.8 Laochiki# Design Bureau

The formal name of this design bureau is the Number 577 Experimental Design Bureau (OKB-577). This is a fighter craft design bureau led by S. Laochiki#. Later, on an order by Stalin, this design bureau was shifted from aircraft development to the

development of the early-stage strategic surface-to-air missiles and strategic cruise missiles in the Soviet Union. In the mid-fifties, P. Grossen left the design bureau, and organized the well-known Iskra Machinebuilding Design Bureau. The Laochiki# Design Bureau had great success in the development of remote-controlled planetary spacecraft; now, the design bureau has been named as the Papakin# Research Institute.

3.9 Makoyaf# Design Bureau

This design bureau was established in the mid-fifties. The design bureau was separated from the Korolyev First Experimental Design when the design of such projects as the SCD missiles (R-11) and the early ship-launched ballistic missiles, moved from the Kaliningrad Plant to a new plant located in Mias#. For many years, under the leadership of V. Makarev#, the design bureau has become a development organization of ship-launched ballistic missiles in Russia.

3.10 Mikoyan Design Bureau

The formal name of this design bureau is the Number 155 Experimental Design Bureau (K-155). This MiG fighter craft design bureau undertook many developments of air-to-air missiles and cruise missiles. After M. Gurevich died, the Bilits Niyak# team was approved to separate from today's Raduga Machinebuilding Design Bureau.

3.11 Najilaji# Design Bureau

The design bureau was organized by A. Najilaji# and I. Satowski#; the bureau was separated in the mid-sixties from the Korolyev First Experimental Design Bureau (OKB-1), engaging in the development of solid-fueled ICBMs. Now, the design bureau is called the Soyuz Consortium for Scientific Research and Production, and the Heat Engineering Institute of Science and Technology (HII), as the major design bureau engaged in solid-fueled ICBMs.

3.12 Nepubidimi# Design Bureau

Located in Kolomna, this engine design bureau was headed by B. Saverin#. In the late fifties, the bureau began developing missiles. C. P. Nepubidimi# was the most closely involved with the missile development project since he was the bureau head in subsequent years. The design bureau specialized in developing portable surface-to-air missiles, antitank missiles, and tactical ballistic missiles. Occasionally, the bureau is referred to as the Machinebuilding Design Bureau.

3.13 Scientific Research Institute for Instrument-Making

Located at Rukovski#, the Scientific Research Institute for Instrument-making (NIIP) is one of the major radar research centers in Russia. Beginning from developing the SA-6 Gainful missiles, the design bureau also undertakes the development of some tactical surface-to-air missile systems, as a comprehensive design bureau.

3.14 Innovator Design Bureau

Located at Sverdlovsk (Yekaterinburg), the design bureau was organized by L. Liulief#. The bureau was the first organization taking part in development of antiaircraft guns. Later, the design bureau turned to the development of surface-to-air missiles. Still later, the bureau took part in cruise missile development, specializing in developing air-to-surface missiles. Today, this design bureau is called the Innovator Consortium for Scientific Research and Production.

3.15 Nocherman# Design Bureau

Located at Moscow, this design bureau is also called the Number 16 Experimental Design Bureau (OKB-16). The bureau is best known for the design of aircraft cannons. In the late fifties, the bureau was assigned to develop early antitank missiles. In addition, the bureau took part in the development of surface-to-air (low-altitude) missiles, such as the SA-9 and

SA-13.

3.16 Raduga Design Bureau

The Raduga Machinebuilding Design Bureau is located at Dubna. Grown out of the Mikoyan Number 155 Experimental Design Bureau (OKB-155), the design bureau serves missile design. The OKB-155 undertook the development of early-stage winged cruise missiles. In 1957, A. Belineatska# was approved to organize his design bureau in order to engage in the development of air-to-surface missiles.

3.17 Tupolev Design Bureau

Located at Tushino, the formal name of this design bureau is the Number 134 Experimental Design Bureau (OKB-134). This design bureau engages mainly in the development of aircraft weapon systems, and this is the first bureau to develop many early-stage air-to-air missiles and surface-to-air missiles. However, since the bureau performed too many projects exceeding its resources, some air-to-air missile research projects were merged into the Pennant Design Bureau, which was founded in the mid-sixties.

3.18 Pennant Design Bureau

Located at Tushino, the Number 134 Experimental Design Bureau (OKB-134) was assigned many research tasks of early Soviet missiles. Since too many vast projects were assigned to the bureau, leading to some failures, some design projects were dispersed, thus the Pennant Design Bureau was founded for development of air-to-air missiles. Hereafter, the design bureau shared the air-to-air missile projects of the Bisnowat# Design Bureau/Molniya Design Bureau. The present Pennant State Machinebuilding Design Bureau (GosMKB) was located at Moscow. Together with the Nova Design Bureau, both are one part of a special technology consortium.

3.19 Nova Design Bureau

Beginning in 1966, the Nova Experimental Design Bureau has worked in the missile field. The X-66 (AS-7 black ox) missile was a joint development project with the Pennant Design Bureau. Thereafter, the Nova Design Bureau became a major research organization for tactical air-to-surface missiles in Russia. Today, the Bureau is located at Kalinin near Moscow.

3.20 Yangel Design Bureau

The formal name of this design bureau is Number 586 Professional Design Bureau (SKB-586). In the mid-fifties, the bureau was founded at Dnepropetrovsk to develop ICBMs. At the outset, the design bureau was headed by M. Yangel. Today, the bureau is called the Southern Machinebuilding Consortium for Scientific Research and Production. The bureau is located in Ukraine.

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